Pre-Analysis Plan
Scorching Streets: Heatwaves and Gig Workers in India

Yutong Chen* Md Amzad Hossain† Sheetal Sekhri‡

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1 Background

As climate change intensifies, heatwaves are becoming more frequent, intense, and prolonged across the world. Global temperatures have already risen by 1.29°C above the long-term average (1951-1980) as of 2024,[1] and projections indicate continued warming in the coming decades (Perkins-Kirkpatrick and Lewis, 2020; Thompson et al., 2023). India, due to its tropical geography and high urban density, is among the countries most vulnerable to extreme heat events. The summer of 2024 was particularly alarming. India experienced prolonged heat waves between March and June, resulting in more than 40,000 suspected cases of heat stroke and more than 700 deaths related to heat.[2] These events not only threaten public health but also lead to significant economic losses, particularly in sectors that depend on outdoor labor. Studies suggest that heat waves reduce worker productivity and result in direct income losses ranging from $41–90 per worker in sectors like agriculture and construction (Orlov et al., 2019). Despite these severe consequences, many affected communities in low- and middle-income countries remain underprepared, with limited access to adaptive resources and public support systems.

In this evolving context, India's rapidly expanding gig economy faces a unique vulnerability. Gig workers, particularly those in outdoor delivery services, face increased exposure to extreme heat while lacking formal labor protections typically provided to salaried employees. These workers are commonly paid by the task, for example, per delivery or ride, and rarely have access to health insurance, paid sick leave, or regulated work hours. These workers spend prolonged periods outdoors during peak heat hours, often with minimal capacity to adapt. Previous research has demonstrated the significant health and economic costs of exposure to heat. However, little is known about effective interventions to mitigate these effects among informal sector workers. Hence, there is an urgent need to evaluate scalable interventions, such as cash transfers, that can

*Department of Economics, University of Texas at Arlington; Email: yutong.chen@uta.edu
†Department of Economics, University of Arkansas; Email: mdamzadh@uark.edu
‡**Corresponding Author**: Department of Economics, University of Virginia, Email: ssekhri@virginia.edu
[1]Statistics are from this website.
[2]Statistics are from this news article.

help informal workers adapt to worsening climate risks without sacrificing their health or livelihoods.

Our project examines whether small cash transfers can help gig delivery workers in India adapt during periods of extreme heat, classified as heatwaves. We will conduct a randomized controlled trial involving 276 gig workers in Delhi and Gurgaon during the summer of 2025. While both treatment and control groups will receive notifications about the onset of a heatwave, only the treatment group will receive heatwave-indexed cash transfers. Weekly surveys will track labor outcomes, including productivity (measured by deliveries completed), days worked, and hours worked per day. We will also collect data on health indicators—such as headaches, stomachaches, vomiting, and fatigue—and on adaptation behaviors, including hydration practices and schedule adjustments. By providing timely financial support, the intervention aims to assess whether modest cash transfers can sustain productivity and reduce heat-related health risks. This is because liquidity constraints may hinder workers from taking adaptive measures even when they are aware of the risks. Thus, our transfers will happen at the beginning of a heatwave to offset this constraint.

This project is expected to make two primary contributions. First, it adds to the growing literature on climate change—particularly extreme temperature—and their affects on labor market outcomes. Lai et al. (2023) offer a comprehensive review of how temperature impacts labor productivity across various contexts.[3] Prior research has documented the adverse impacts of extreme heat on labor supply and health (Graff Zivin and Neidell, 2014; Kjellstrom et al., 2016). In developing countries, most studies have focused on workers in the agricultural (Gupta et al., 2017; Stevens, 2019) and manufacturing sectors (Chen and Yang, 2019; Somanathan et al., 2021; Zhang et al., 2018), where the physical intensity of work increases vulnerability to heat. However, evidence on the service sector, particularly gig and on-demand platform work, remains limited. A closely related study by LoPalo (2023) finds that survey interviewers conduct 13.6% fewer interviews on the hottest days in 46 developing countries. Similarly, Ge et al. (2024) find that gig delivery workers on an on-demand food delivery platform in China received more order requests but faced greater delivery delays during heatwaves in July and August 2015. Our study differs from this prior work by focusing specifically on heatwaves—defined by prolonged periods of extreme heat—rather than isolated instances of high temperature, and by exploring their effects on productivity, health, and adaptive behaviors among gig delivery workers.

Second, our project contributes to the emerging literature on climate adaptation tools, particularly the use of financial instruments to buffer the effects of climate shocks. Prior research has shown that cash transfers can enhance household resilience to weather-related shocks and yield long-term welfare benefits (Gertler et al., 2012; Macours et al., 2022). For example, Lane (2024) find that guaranteed credit helps Bangladeshi farmers adapt to flooding. Similarly, Pople et al. (2021) show that anticipatory cash transfers enable households to take preventive measures against floods and reduce food insecurity. Premand and Stoeffler (2022) also demonstrate that

[3] A substantial body of research explores the effects of higher temperatures on mortality, health, agricultural output, income, schooling outcomes, racial disparities, violence and conflict, as well as adaptation in these sectors.

regular cash transfers in the Sahel protect household income from drought-related shocks in both agricultural and off-farm activities. Yet, causal evidence on effective adaptation strategies for gig workers—a rapidly growing segment of informal labor—remains limited. To our knowledge, this is among the first experimental studies to evaluate the effectiveness of heatwave-indexed cash transfers as a real-time climate resilience mechanism for urban gig workers. Unlike traditional workfare or insurance-based approaches, the intervention provides immediate liquidity in response to environmental shocks.

2 Research Design

We will conduct a randomized controlled trial (RCT) with a sample of 276 gig delivery workers in Delhi and Gurgaon during the peak summer months of 2025 (May 19 to June 30). Participants are stratified by industry type—specifically, those engaged in food delivery, grocery delivery, and ride-hailing services (characterized by time- sensitive demand for deliveries) versus those in courier and porter services (with more flexibility)—and then randomly assigned to one of two groups using a computer-generated randomization procedure in STATA. A total of 137 participants will be assigned to the treatment group, with the remaining individuals comprising the control group. The intervention consists of a cash transfer, disbursed via mobile payment each time a heatwave is declared, with notifications sent via WhatsApp or text message.

We define heatwave events based on the criteria provided by the India Meteorological Department (IMD): a heatwave occurs when the maximum temperature departs from the normal by at least 8.1°F (or 4.5°C) for two or more consecutive days. We obtain historical and forecasted weather data for Delhi from Visual Crossing. We use the average maximum temperature between May 19 and June 30 across the years 2019, 2020, 2021, 2022, and 2023 as the reference period. The five-year average during this window in Delhi is 101.3°F (or 38.5°C); therefore, if the maximum temperature in 2025 exceeds 109.8°F (or 43.0°C) for at least two consecutive days, we will classify it as a heatwave and notify participants of the event.[4]

We will track outcomes through one baseline survey, six weekly surveys conducted between May 19 and June 30, and one endline survey in September 2025, yielding a total of 2,208 observations (276 participants × 8 survey rounds). Each weekly survey includes a core set of four questions on productivity and health outcomes. In weeks when a heatwave is declared, an additional question is asked to capture adaptation strategies, such as adjustments in work schedule, hydration practices, and use of cooling resources. The endline survey will include more detailed questions, including participants' mental health status and their willingness to pay for a similar financial product in the future. This will help us assess the perceived value of such an insurance-like intervention.

We will start data analysis in October 2025. To estimate the impact of the intervention, we will

[4]The five-year average during May 19 and June 30 in Gurgaon is 101.4°F (or 38.5°C).

use the following reduced-form regression specification for each outcome:

$$Y_{it} = \alpha_i + \delta_t + \beta \cdot (Treat_i \times Heatwave_t) + \epsilon_{it} \tag{1}$$

where Y_{it} denotes the outcome variable for individual i at time t; $Treat_i$ is a binary indicator equal to one if individual i was assigned to the treatment group, and zero otherwise; and $Heatwave_t$ is an indicator for whether time t coincides with a heatwave event. The coefficient of interest is β, which captures the causal effect of receiving the cash transfer during heatwaves. α_i represents individual fixed effects, which control for all time-invariant characteristics, and δ_t denotes time-fixed effects, which absorb period-specific shocks common to all individuals. Standard errors will be clustered at the individual level. We will also examine heterogeneity in treatment effects by industry type and location.

3 Main Outcomes

3.1 Labor Supply Outcomes

We will examine several measures of labor supply to assess how the intervention influences work behavior during heatwaves. These include the number of days worked per week, the average number of hours worked per day, and productivity measured as the total number of deliveries completed per day each week.

3.2 Health Outcomes

To evaluate the intervention's impact on worker health, we will collect self-reported data on heat-related symptoms, including headaches, stomachaches, vomiting, and fatigue.

3.3 Adaptive Behaviors

We will document a range of adaptive behaviors that workers may adopt to mitigate the effects of heatwaves. These include behavioral adjustments, such as changes in work timing or intensity in response to heat stress—for example, avoiding afternoon work by shifting to early morning or late evening hours, and reducing overall work hours. We will also track self-initiated adaptations, such as purchasing extra water or ice, wearing full-sleeve T-shirts for sun protection, and consuming glucose or oral rehydration salts (ORS) to prevent dehydration and fatigue. In addition, we will examine whether platforms provide any support during heatwaves, such as access to rest points equipped with coolers or air conditioning, or the provision of additional commission payments.

4 Heterogeneity Analysis

We will explore heterogeneity in treatment effects along two broad dimensions: industry type and location.

First, we will examine differences by industry type, distinguishing between workers where demand for deliveries is time sensitive, such as food delivery, grocery delivery, and ride-hailing services, and those where demand is flexible, including courier and porter services. Workers in time-senstive sectors typically face stricter delivery time constraints and have less control over their schedules, potentially leading to greater exposure to extreme heat. We will assess whether the intervention is more or less effective for workers in these high-exposure roles.

Second, we will assess heterogeneity by location, comparing participants operating in Delhi versus Gurgaon. While both cities experience similar temperature patterns, the level of institutional or platform support may differ. For example, delivery platforms in Delhi may be more likely to provide cooling facilities or additional compensation during extreme weather conditions. These local differences in the operational environment may influence how workers respond to the intervention, and we will test whether its effectiveness varies accordingly. Delhi also has a drinking water problem which implies that adaptation by using water might be more costly.

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